

We Claim:

1. A method for forming an array of a sample material on a surface of a substrate, comprising the steps of

providing a vesicle having an interior chamber containing a fluid,

disposing said vesicle adjacent a first location on said surface of the substrate,

controlling said vesicle to eject from said chamber a nanoliter volume of the fluid to dispense said fluid at said first location of said surface of the substrate, and

moving said vesicle to a set of positions adjacent said surface of the substrate, whereby fluid is dispensed at each location of said set for forming said array of sample material.

2. A method according to claim 1, including the further step of

providing a substrate having wells formed on said surface of the substrate for defining locations for receiving said fluid ejected from said chamber.

3. A method according to claim 1, including the further steps of

depositing a matrix material on a surface of said substrate.

4. A method according to claim 3, including the further step of

waiting a predetermined period of time to allow the solvent of said matrix material to evaporate.

5. A method according to claim 4 wherein said step of ejecting a nanoliter volume of fluid includes the step of ejecting said fluid onto said evaporated matrix material to dissolve with said matrix material and to form a crystalline structure on said substrate surface.

6. A method according to claim 1 including the step of

mixing an analyte material with a matrix material to form a solution, and

filling said interior chamber with said solution.

7. A method according to claim 1, including the further step of

00706988-012397

Sub
201

providing said substrate with said array of sample material disposed thereon to a diagnostic tool for determining information representative of the composition of said sample material.

8. A method according to claim 7, wherein said step of providing said substrate to a diagnostic tool includes the step of

providing said substrate to a diagnostic tool having a mass spectrometer.

9. A method according to claim 1, wherein said step of providing a vesicle having an interior chamber includes the step of providing a vesicle having a piezoelectric element for causing fluid to move through said chamber.

10. A method according to claim 9, wherein said step of moving said vesicle includes the step of rastering said vesicle across said surface of said substrate.

11. A method according to claim 1 wherein said step of providing a vesicle includes the step of providing a vesicle assembly having a plurality of vesicles arranged into a matrix for dispensing fluid to a first plurality of locations on said substrate surface.

12. A method according to claim 11 wherein said step of moving said vesicle array includes the step of determining an offset signal representative of a distance for moving said vesicle assembly to a location adjacent said first plurality of locations.

13. A method of according to claim 12 wherein said step of moving said vesicle assembly includes the step of moving said vesicle assembly over said surface of said substrate to form a matrix of locations having fluid ejected thereon.

14. A method according to claim 1, including the further step of
drawing a wash fluid into said chamber to rinse said chamber.

15. A method according to claim 1, including the further step of
contacting said vesicle to a source of fluid material for filling said chamber by capillary action.

16. A method according to claim 1, including the step of
providing a substrate material comprising silicon.

17. A method according to claim 1, including the step of
providing a substrate material comprising a metal material.

08786988-012397

Sub
807

18. A method according to claim 1, including the step of providing a substrate material comprising a plastic material.
19. A method according to claim 1, including the step of providing a substrate material comprising a membrane.
20. A method according to claim 1, including the step of providing a substrate material comprising a polymeric material.
21. A method according to claim 1, including the step of providing a substrate material comprising metal-grafted polymers.
22. A method according to claim 1, including the step of providing a chemically functionalized substrate material.
23. A method according to claim 1, including the step of providing a substrate material functionalized with beads.
24. A method according to claim 1, including the step of providing a substrate material functionalized with a dendritic material.
25. A method for analyzing a material, comprising the steps of providing a vesicle suitable for carrying a fluid having said material therein, disposing said vesicle adjacent a first location of a surface of a substrate, controlling said vesicle to deliver a nanoliter volume of the fluid to provide a defined and controlled volume of said fluid at said first location of said surface of the substrate, moving said vesicle to a second position adjacent a second location on said surface of the substrate to dispense a defined and controlled volume of said material along an array of locations on said substrate surface, and performing mass spectrometry analysis for said material at each location of said array.

08786988-012397

Sub
031

26. A method according to claim 25 wherein said step of providing a vesicle, includes the step of

mixing a matrix material and an analyte material to form said fluid material.

27. A method according to claim 25, including the steps of

providing a vesicle having an interior chamber suitable for holding a fluid, and

filling said chamber with a matrix material and dispensing said matrix material to said array of locations.

28. A method according to claim 25 wherein said step of performing mass spectrometry includes the step of performing matrix assisted laser desorption ionization mass spectrometry.

29. A method according to claim 25 wherein said step of performing mass spectrometry includes the step of performing a time of flight mass spectrometry analysis.

30. A method according to claim 25 wherein said step of performing mass spectrometry includes the step of performing a fourier transform mass spectrometry analysis.

31. Apparatus for forming an array of a sample material on a surface of a substrate, comprising

vesicle having a distal end suitable for carrying a fluid thereon,

a movable arm having a distal portion mounted to said vesicle,

a controller for moving said arm to dispose said vesicle adjacent a first location on said surface of the substrate and for controlling said vesicle to provide a nanoliter volume of the fluid at said first location of said surface of the substrate, and

a diagnostic tool for analyzing said material to generate a composition signal representative of the chemical composition of said material.

32. Apparatus according to claim 31 wherein said vesicle comprises a solid shaft of material.

33. Apparatus according to claim 31 wherein said vesicle comprises an interior chamber suitable for carrying a fluid material.

08736988 : 012397

Sub
a31

- add
a27
- add377